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ABSTRACT

Cognitive style models describe individual differences in information-processing, or methods for deriving meaning from the world. Each style is theoretically value-free; each is valid and has strengths or weaknesses depending upon its context. However, this value freedom has been threatened in two ways. First, while cognitive style has been ignored by most educators, typically, those behaviors consistent with one pole of a style dimension have implicitly or explicitly been valued, thereby devaluing the alternative style. Second, sex differences in cognitive style tend to be such that those styles that predominate among males are favored by educators and researchers. It may be concluded that one of the merits of the concept of cognitive style is that any style is valid and valuable. However, value judgments, often redundant with sex and sex role differences, have denied such contributions as the field dependent's ecological sensitivity and the intuitive's talents for problem-definition and brainstorming. Research by practititoners suggests that style-biased education cuts off options for individuals and favors stereotyping and stagnation within courses and careers. Style-sensitive educational programming capitalizes on the strengths of the style that one brings to a task and provides means of developing individual and educational flexibility. (Author)

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Cognitive Styles and Sex Roles in Teaching-Learning Processes[1]

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Cognitive style models describe individual differences in information-processing, or methods for deriving meaning from the world (Kogan, 1971). Through over twenty-five years of research, fifteen or more style dimensions have emerged, all sharing a basic set of attributes. Styles are pervasive, relatively stable characteristics describing modes or processes rather than content (Witkin et. al., 1975). They contrast most importantly with abilities. Styles are bipolar, each pole or style having adaptive value. For example, an individual may be field dependent, neutral, or field independent. Each of these three 'styles' is theoretically value-free; each style is valid and has strengths or weaknesses depending upon its context.

However, this value freedom has been threatened in two ways, First, while cognitive style has been ignored by most educators, typically, those behaviors consistent with one pole of a style dimension have implicitly or explicitly been valued, thereby devaluing the alternative style. Second, sex differences in cognitive style tend to be such that those styles that predominate among males are favored by educators and researchers.

One consequence of the general ignorance of cognitive style is noted by Messick (1972):

> it is quite possible that cognitive styles are already being reflected in standard evaluation devices; however, their operation under these circumstances is not being assessed for evaluation purposes but serves instead to contaminate the interpretation of other measures. (p. 111)

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Beyond confounding evaluation, cognitive style, when mismatched with the implicit style of the learning task, is often misconstrued as low motivation, poor study habits, or low intelligence. The purposes of this paper are to:

1) indicate known sex differences in cognitive style;

2) examine the educational implications of such style differences; and

3) describe recent research which attempts to utilize cognitive style information in educational settings.

One example of the relationship between sex differences in style and their educational implications concerns broad v. narrow categorizing. When asked to sort or group objects or words, the broad categorizer prefers a small number of categories each containing a large number of items, whereas the narrow categorizer prefers a larger number of categories with a small number of items in each. Like most style dimensions, breadth of categorization emerges earlier in females. In addition, at eighteen months, females in general use broader categories than males; however, the pattern subsequently reverses such that males use greater breadth of categorization in later childhood and adulthood. Furthermore, teachers prefer narrow categorizing females. Broad categorizing females are seen as disruptive and troublesome. Women who categorize broadly are lower in judgmental confidence and more conservative on most decision-making indices (Kogan,1976). In this case, then sex differences are reinforced and perpetuated by teachers -- and when females adopt the 'male' style, negative attributions are one consequence.

Four additional models of cognitive style share sex differences as well as important educational implications. They are reflection-impulsivity, cognitive simplicity-complexity, field dependence-independence, and a recently developed information-processing model. The first two of these models differ not so much in frequency as in educational implications and generality of style.

Reflection-impulsivity refers to conceptual tempo. When several alternatives must be considered under time constraints, as for example, in timed multiple-choice tests, the impulsive individual responds quickly but is often 'almost right,' yielding a high error score. The reflective individual considers each alternative in turn, responding more slowly but with fewer errors. Note that it is only when time constraints and multiple hypotheses pertain that this dimension emerges. Research on reflection-impulsivity does not reveal sex differences in frequency of each style (Kogan, 1976); rather, while impulsivity or reflectivity in males has educational implications, there are no consistent findings regarding the implication of this dimension for females and, therefore, no operational definition for females (Lesser, 1971; Block and Block, 1974; Kogan, 1976). We are told that error score in males relates to impulsivity but in females it relates to low intelligence; that impulsivity in boys is bad but it is good in girls; that inhibition or passivity rather than reflection is the opposite of impulsivity or aggressiveness; above all, we are told that none of these assertions is entirely true (Kogan, 1976).

Early researchers found greater impulsivity in boys and proceeded to destroy the value-freedom of the model by focusing only on the negative

consequences of impulsivity. Kogan (1976) suggests that new scoring procedures may restore value-freedom of the model and permit examination of the relationship between impulsivity and originality, for example. For this dimension, then, examination of the research suggests two critical problems. First, in the absence of operational definitions of reflection and impulsivity that pertain to both males and females, we don't really know what the standard measures are actually measuring. Second, the loss of value-freedom effectively precludes intelligent implementation of reflection - impulsivity as a cognitive style dimension.

Cognitive simplicity-complexity is a second dimension which shares these two problems. Sex differences do not emerge in the frequency of each style; instead, the sex difference noted by Kogan (1971) concerns generality of this style. While generality of complexity was found for males, virtually none was found for females, implying that women may be complex some of the time but they will be simple in style more frequently than their complex male counterparts.

Like reflection-impulsivity this dimension is also plagued by problems of value freedom. While an individual might prefer to be labeled a narrow categorizer and see it as sensitivity to differences or, on the contrary, prefer to be labeled a broad categorizer and see it as a synthetic or organizing ability, few of us would prefer to be labeled cognitively simple. Consider, however, comments by Messick (1976). He argues that the use of many dimensions may reflect pigeon-holing or compartmentalization of stimuli, while using one or a few dimenstions may stem from tolerance of perceived

differences or use of a superordinate category to integrate stimuli. There are several educational implications of Messick's comments. First, if a teacher presumes cognitive complexity, his or her students may understand it to mean that they should compartmentalize. Second, when students are tackling new concepts the cognitively simple approach may be advantageous. Kogan (in Lesser, 1971) reports that students high in complexity attain higher grades in the social sciences and the humanities, students low in complexity attain higher grades in engineering, and there is no relationship between simplicity-complexity and performance in the natural sciences. The findings regarding engineering may reflect the merits of a simple analytical approach as a necessary precursor to more complex, integrative approaches. Finally, situational variation in simplicity-complexity may be evidence of efficient strategies, using a cognitively simple approach in novel or unfamiliar settings and a cognitively complex approach in more familiar ones. Thus, the finding of less generality of simplicity-complexity among females may represent flexibility along this style dimension. As Wapner (in Messick, 1976) notes, an individual occupies a range along any cognitive style dimension and can learn to use strategies favoring one pole or the other, depending upon the context in which he or she is operating. Here, then, as in reflection-impulsivity, questions of value freedom and sex differences are closely related.

Field dependence-independence describes self-non-self segregation. The field independent individual separates her/himself from a setting and easily identifies separate features, rules, etc. despite irrelevant cues. The field dependent individual utilizes a more holistic approach, responding to

interrelatedness of self and surround, excelling in responsiveness to ecological and interpersonal cues. There are no differences between field dependents and independents in learning ability or memory, nor in such qualities as emotional dependence and approval - or attention-seeking (Witkin and Goodenough, 1976).[3]

There are small, but persistent, sex differences in field dependence-independence in Western cultures (Witkin et. al., 1975). As in the case of styles mentioned previously, the dimension emerges about a year earlier in girls. Girls are more often field independent in preschool, but the trend is reversed at about age six (Kogan, 1976). Field dependent and independent individuals tend also to choose careers consistent with traditional sex role stereotypes, field independents tending to choose technical, analytical fields and field dependents choosing social service and people-oriented careers. Even within a single occupation, field dependents and independents behave differently. Psychiatric nurses are more often field dependent, surgical nurses field independent. Teachers and therapists who differ along this dimension teach and counsel differently (Witkin et. al. 1975).[4]

Although Witkin is among the most visible proponents of style as a value-free construct, during the 1950's and '60's, his research consistently denigrated field dependence. Field independence was labeled analytical and articulate, while field dependence was defined largely as the absence of these qualities. Only in the last year has Witkin made a genuine effort to describe field dependence in a favorable light, despite substantial evidence attesting to its merits (Witkin and Goodenough, 1976).

The final cognitive style model to be considered here describes two separate dimensions of information-processing. Data orientation may be receptive -- tending to take in raw data and focus on discrete bits of information -- or preceptive -- tending to organize data conceptually and to seek relationships between elements of the data set. The strategy dimension distinguishes the systematic -- step-by-step, method-oriented -- approach from the intuitive approach, which focuses on problem definition, generating a range of alternatives, and defending solution in terms of problem-definition rather than method (McKenney and Keen, 1974).

A study of 337 college students provides data on this information processing model. Although there are no sex differences in scores across all four tasks assessing data and strategy orientation, women are more often intuitive (X^2 = 5.879, 2 df, $p = .05$), and tend to be more receptive as freshmen. As seniors, women are more intuitive and preceptive, men more systematic and receptive.[5] The intuitive receptive style of freshmen females has the greatest flexibility and openness, but the shift toward a preceptive data orientation adds structure, leaving strategy open, whereas male increases in receptive style add data openness to structured systematic processes. In this study, we also found differences in style by major, natural science majors tending to be systematic and receptive, humanities majors intuitive and preceptive, and social science majors having the greatest flexibility in style. In our sample, however, there were no sex differences in frequency of major (X^2 = .438, 2 df, p = .803). Sex and major thus relate to style but not to each other. This complex interaction is exemplified by one of our tasks which

gave students writing options. Sex, major, and style, in that order, were significant determinants of the problem students chose when given several options.

These findings are also important in that they demonstrate that students, male and female, can choose any college major and develop any style. Men who are humanities majors are often intuitive and preceptive and women who are natural science majors are often systematic and receptive.

Although the preceding discussion has focused on sex differences in cognitive styles, it is important to note that sex differences have diminished substantially over the last ten or fifteen years. As women and men have become more flexible in their educational choices, cognitive styles have become less sex-role stereotyped. Despite the decline of sex differences in research data, value judgments relating to style persist. Being field dependent or intuitive is bad -- even if you're male. As a result, the remainder of this paper focuses less on sex differences and more on the educational implications of style as a value-free construct.

Until recently, such dimensions as field dependence-independence have been examined largely in terms of correlates of style, favoring the identification of sex and major and career differences. Recently, emphasis has shifted from the quest for static correlates to three process areas:

1) learning differences;

2) style-sensitive educational programs; and

3) strategies for increasing cognitive flexibility.

Each of these research areas benefits from the involvement of practitioners.

As Beck (1977) points out: "theoretical work in psychology cannot be conducted very successfully without constant feedback from fields of practical application." (p. 30)

One recent program, conducted by the Two Year College Development Center, State University of New York, represents such involvement. In Project Priority, teams of teachers, counselors, and administrators first participated in a series of workshops exploring twelve models of style, then investigated style through campus-based projects (Martens, 1976). Most of the participants chose to work with field dependence-independence and/or systematic-intuitive dimensions. Although the sample size is usually small and the designs not always tightly controlled, the projects are notable in that practitioners themselves determined their problems and how cognitive style information might help them.

Chickering (1976) argues that ignorance of cognitive style leads to the implementation of educational programs that create double binds; no style is favored. In attempts to determine <u>how</u> individuals with alternative styles learn, several of our participants examined student reactions to learning options. Hileman and Desmond[8] investigated the resources students prefer to use in accounting and composition courses, respectively. Both found that field dependents use people-oriented options (peer tutors, discussion groups, consultations with the professor) more than their field independent classmates and use the text less. However, <u>before</u> exploring the options, there was no difference in expressed preference by students with these styles, both groups

saying they learn best from lectures and the text. The problem may be that the means whereby field dependents learn are devalued in most educational settings. They are seen as expressions of need for help and contrary to independent scholarship. Hileman and Desmond's findings suggest that field dependents simply use different learning options, when such options are available and seen as valid.

Nielsen contributed further information by studying style of our workshop participants as it related to style of consultants and session format. Consistent with previous findings (Witkin and Goodenough, 1976), he found that participants who matched a consultant on field dependence-independence rated that session higher than those who mismatched. Field independent participants also rated independent work higher as a means of learning than field dependents did, whereas field dependents rated individual conference time and social time higher.

There were also effects of systematic and intuitive styles in studies by both Nielsen and Desmond. Nielsen found that systematic participants prefer small lecture relative to their intuitive counterparts, while intuitives prefer small discussion and question and answer periods.[9] Desmond found that students neutral on the systematic-intuitive dimension tend to have more consultations with the instructor. This finding is important in that little is known about neutrality on most style dimensions. Neutrals on the information-processing dimensions are more often confused or undecided than are their counterparts with distinctive styles (Nelson, 1976).[10] However, neutrality, like distinctive styles, may be an advantage or disadvantage.

Keen and McKenney (1973) argue that neutrals may be able to operate comfortably with any style, and Witkin and Goodenough (1976) make similar assertions regarding a fluid style on the field dependence-independence dimension. It may be that neutral students need only more structure by which to judge which style or strategy is most adaptive in a given setting.

Witkin et. al. (1975), Messick (1976), and Riessman (in Sperry, 1972) argue for the development of style-sensitive teaching and learning strategies. A first step is to provide cognitive style information to students and teachers. Several studies point simply to the inadequacy of existing methods whereby students choose learning program (Merrill) and instructor (Hjelmeland et. al.)." Several of our studies imply that if students had information about their styles, they might make more adaptive educational choices and have more control over their learning experience.

What, then, happens when such style information is provided? Taylor examined his ability to predict his students' styles, tested them, then used their assistance to improve his teaching effectiveness and the course. He concludes that an instructor with a knowledge of cognitive style can generally tell which style a student prefers. In addition, Taylor's students learned more about their own styles and how students with other styles think and learn.

Students feel that cognitive style information helps them understand past learning successes and failures, and more intelligently select new courses. While some have argued that telling an individual his/her style will lead to

rationalizing and narrowing of options, students report instead that they now understand why some tasks had been difficult for them, and, as a result, are making new efforts to become more intuitive (if they're systematic) or vice versa.[12]

In regard to teacher awareness, Stodola, Abdo and Morgan found that when intuitive instructors teach a psychology course using systematic methods, there is no effect of style on grades. Many of the existing relationships between style and choice of major and career may well be a function of style-biased teaching.

In summary, one of the merits of the concept of cognitive style is that any style is valid and valuable. However, value judgments, often redundant with sex and sex role differences, have denied such contributions as the field dependent's ecological sensitivity and the intuitive's talents for problem-definition and brainstorming. Research by practitioners suggests that style-biased education cuts off options for individuals and favors stereotyping and stagnation within courses and careers. Style-sensitive educational programming capitalizes on the strengths of the style that one brings to a task and provides means of developing individual and educational flexibility.

FOOTNOTES

[1]Expanded version of a paper presented at the Convention of the American Psychological Association, San Francisco, California, August 26, 1977.

[2]Other sex differences in simplicity-complexity are found regarding interpersonal judgment (e.g., Deaux and Farris, 1975). However, Crockett et. al(1975) question examination of this style dimension when evaluative set is induced.

[3]There are also differences in the learning preferences and educational choices of field dependent and independent individuals. Field dependents learn better with clearly planned tasks and corrective feedback; they respond more than field independents to salient cues. Field independents use more mediational processes for inferring rules; they learn concepts by hypothesis-testing whereas field dependents tend to use a more passive, spectator approach. There are, however, no differences in number of trials to criterion and field dependents readily use an hypothesis-testing approach when told to do so. (Witkin et. 21, 1975)

[4]Field dependent teachers prefer interaction using more discussion and more questions to introduce new topics. Consistent with their more holistic orientation, these teachers tend to use lifestyle issues as a means of setting the scene in teaching or testing. In contrast field independent teachers use lecture and discovery approaches, more often. They use questions to check up on students progress, use more corrective feedback, more negative evaluation and more abstract, nonsocial items on tests. Students and teachers, clients and counselors like each other better even after as short a period as twenty minutes, if they are matched on field dependence-independence. Regardless of their own style, counselors tend to use supportive therapy with field dependent clients and modifying therapy with field independents (Witkin et. 21, 1975).

[5]Data derive from the Value Added Project conducted by the Office of Instructional Research and Evaluation, Harvard University, and sponsored by the Fund for the Improvement of Postsecondary Education. Since there are two dimensions in this model, a rectilinear cognitive operating space is calculated based on assessment of all four modes. In this study of students at three separate institutions, we found no difference between males and females in the mean area of the operating space ($F=.050$, $p=677$). This two-dimensional model can also identify data dominant students those whose score on receptive and preceptive tasks exceed scores

on systematic and intuitive tasks) and strategy dominant ones. Only 38 (11.3%) of our sample were data or strategy dominant. However, females were more often data dominant, males more often strategy dominant (X^2 = 3.98, 1 df, $p < .05$). The difference in frequency of receptive style is not significant among freshmen. Among seniors, however, males are more systematic (F=6.903, p = .01) and receptive (F=3.037, p = .08); intuitive and preceptive scores in females are not significantly higher than those in males.

[6]Systematic-intuitive strategy by natural science v. humanities majors yields a X^2 = 4.223, 1 df, $p < .05$; preceptive-neutral receptive style by all three majors has a X^2 = 11.837, 4 df, p = .019.

[7]The Logic and Rhetoric of Exposition Test Offered five essay topics, one of which was to be completed in fifteen minutes. The task was developed, inpart, to assess convergent validity of the style model. As a result each essay differed substantially, from the others. Sex differences in essay topic were significant at the .0001 level (X^2 = 29.397, 4 df), major differences at the .002 level (X^2 = 24.020, 8 df) and systematic neutral-intuitive style at the .01 level (X^2 = 18.987, 8 df).

[8]These reports and others mentioned below, unless otherwise noted, may be found in Martens (1976).

[9]Note that different options were selectectively preferred by field dependent, field independent, intuitive and systematic participants; the two style dimensions do not overlap.

[10]In the Value Added Project, neutrals had the following characteristics:

1) The size of the operating space of neutrals is smaller on the average, suggesting a trade off in which depth is sacrificed for flexibility;
2) more freshmen than seniors have neutral sytles (X^2=4.884, 1 df, $p < .05$);
3) distinctive styles relate to earlier and more confident choices in major and vocation (X^2=5, 125, 2 df, $.10 < p < .05$ for career choice);
4) seniors with neutral styles are uncertain about career choices, but have less often changed their options since freshman years;
5) after completing the Logic and Rhetoric Test, students with neutral styles more often feel the task failed to assess their skills (X^2 = 4.289, 1 df, $p < .05$).

[11]Hjelmeland et. al. found that among 43.4% who use instructor's style as a variable, less than 15% rely on their own analyses of that

style. Not surprisingly, over 50% who thought their style matched that of the instructor at the beginning of the term, felt less well-matched at the end of the term.

[12]These latter reports come from my own students who heard a lecture on style, were tested if they chose to be, and completed a questionnaire during the following quarter at University of California, Irvine.

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